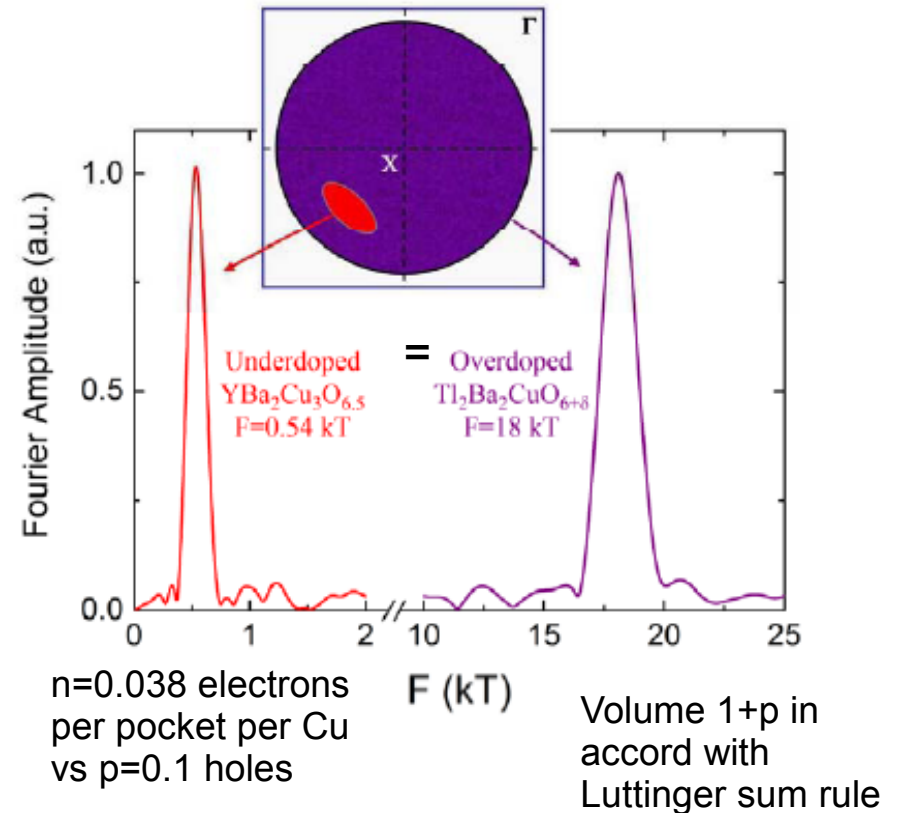
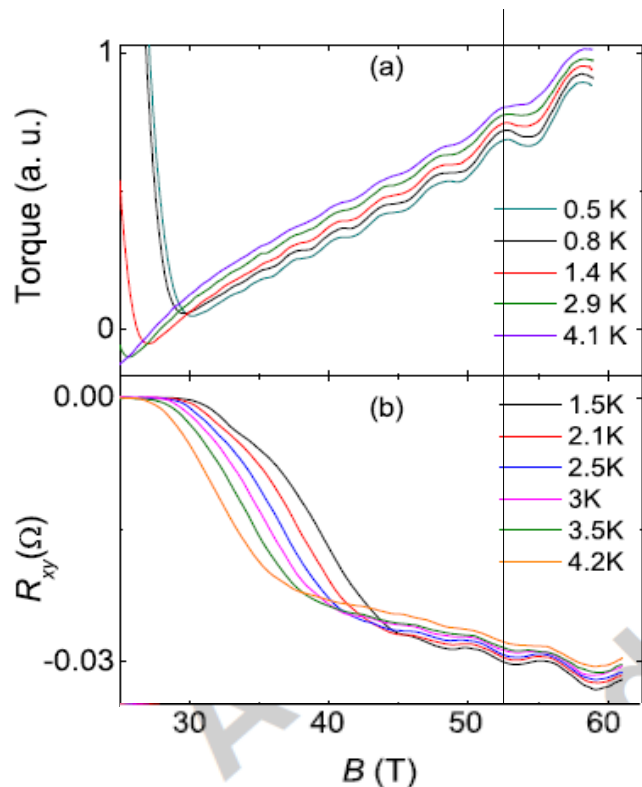


Fermiology and Stripes: Is there room for both?

- How can inhomogeneities/stripes/checkerboard glassy states coexist with LDA like Fermi surface and /or coherent nodal states reported by photoemission?
- Are surface probes (photoemission, STM) and neutrons seen the same thing?
- Are time scales important: Is fermiology OK below a coherence scale above which the fluctuating stripes exist? Are stripes part of the incoherent spectral functions?
- How all this relates to quantum oscillations?
- Can glassy physics save the day?

Quantum oscillations



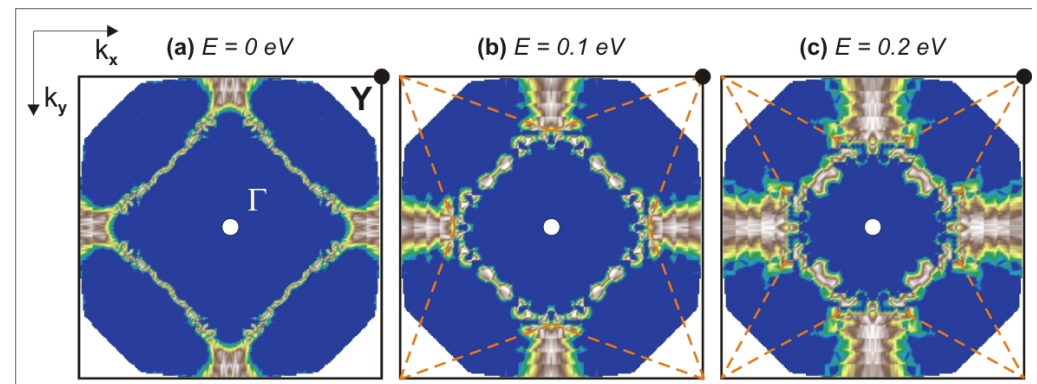
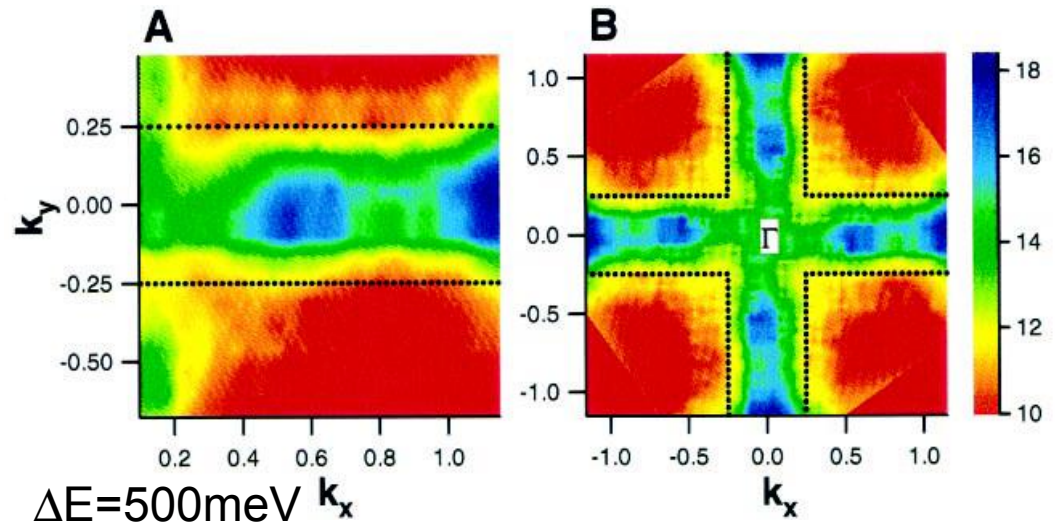
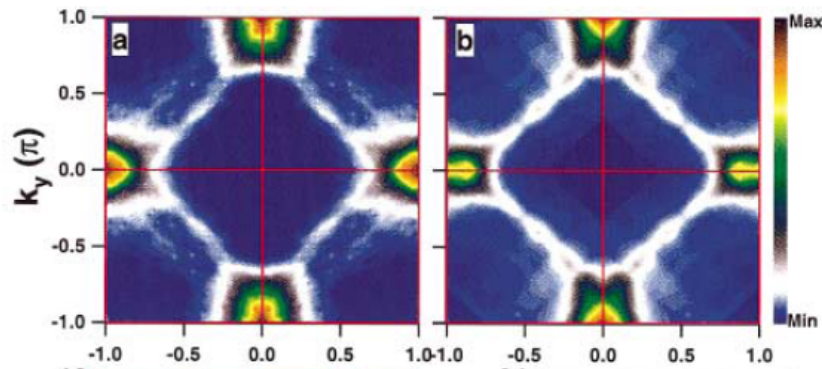
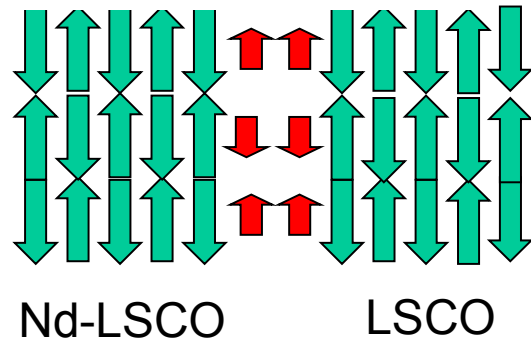
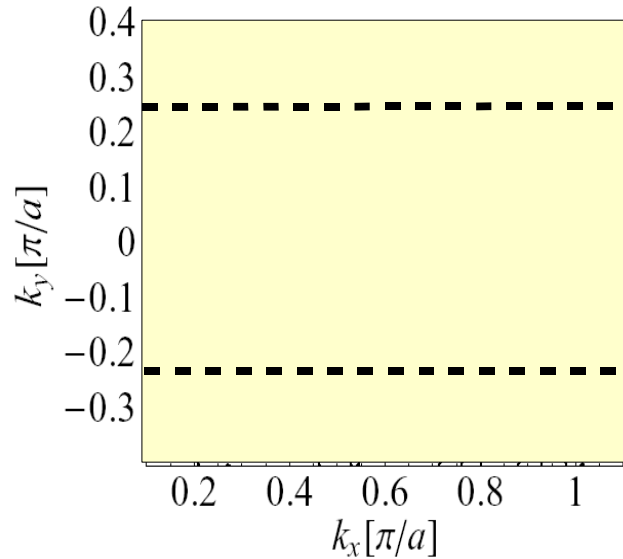
Jaudet, C. Proust et al. '09

How this fits with photoemission ?
 Magnetic induced states and Fermi surface reconstruction? B. Lake and J. Sonier talk

The Fermi surface duality

Strong coupling mean field stripes

$x=0.12$ $\text{La}_{1.28}\text{Nd}_{0.6}\text{Sr}_{0.12}\text{CuO}_4$ Zhou et al. Science 99



J. Chang et al. PRB'07

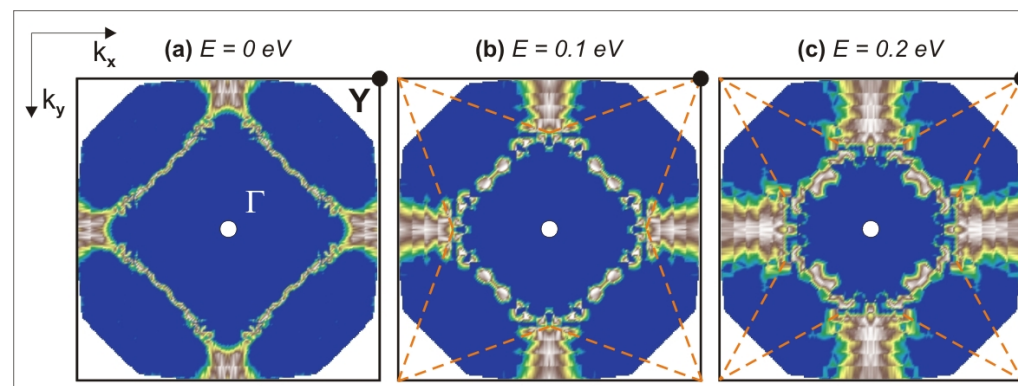
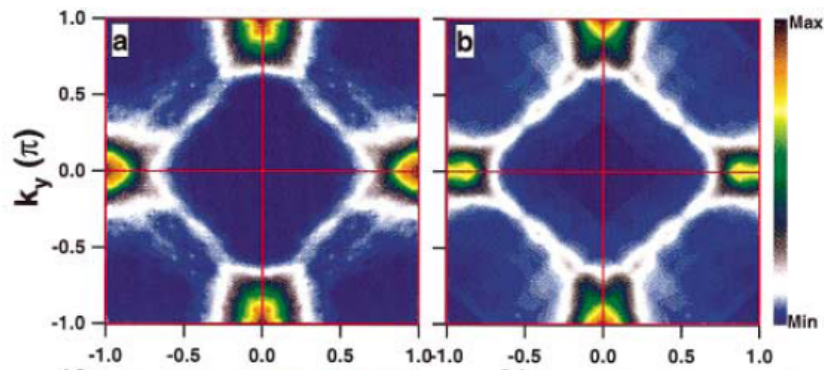
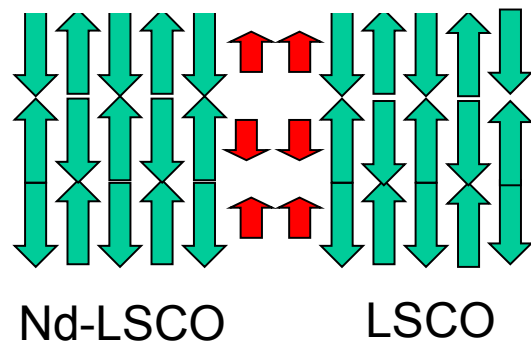
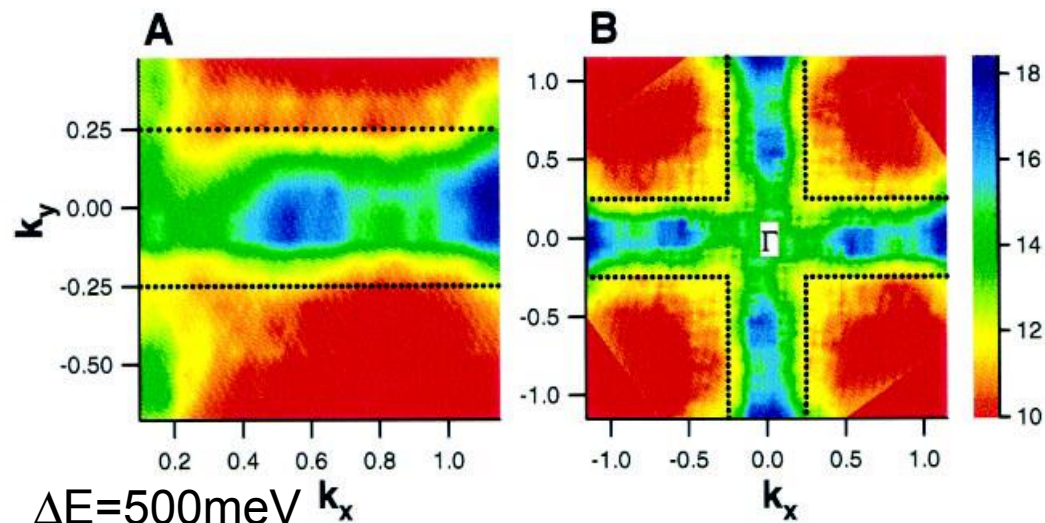
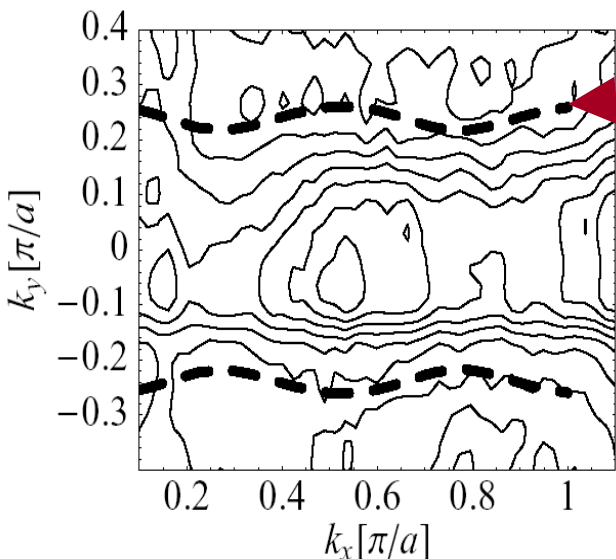
$\Delta E = 30 \text{ meV}$

The Fermi surface duality

Strong coupling mean field stripes

$x=0.12$ $\text{La}_{1.28}\text{Nd}_{0.6}\text{Sr}_{0.12}\text{CuO}_4$ Zhou et al. Science 99

LDA+U
V.I. Anisimov,
et al PRB 70,
172501



J. Chang et al. PRB'07

$\Delta E=30\text{meV}$

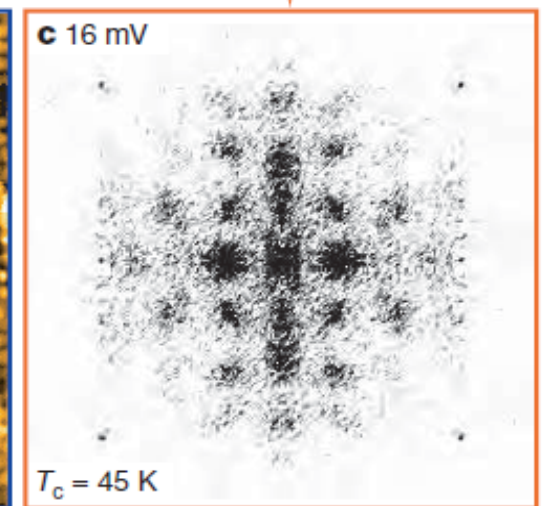
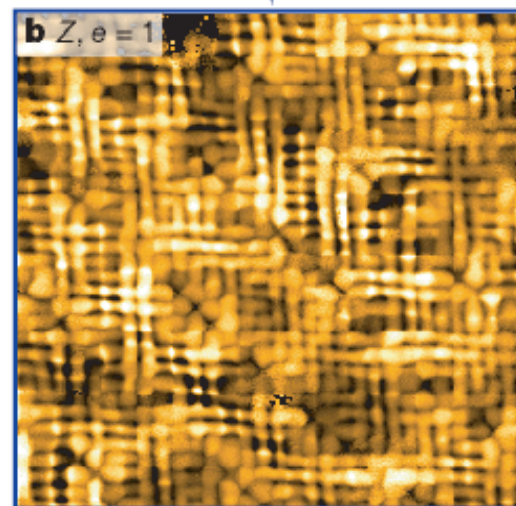
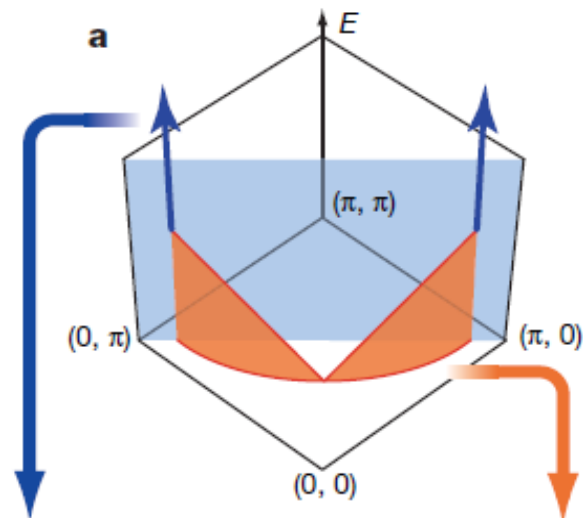
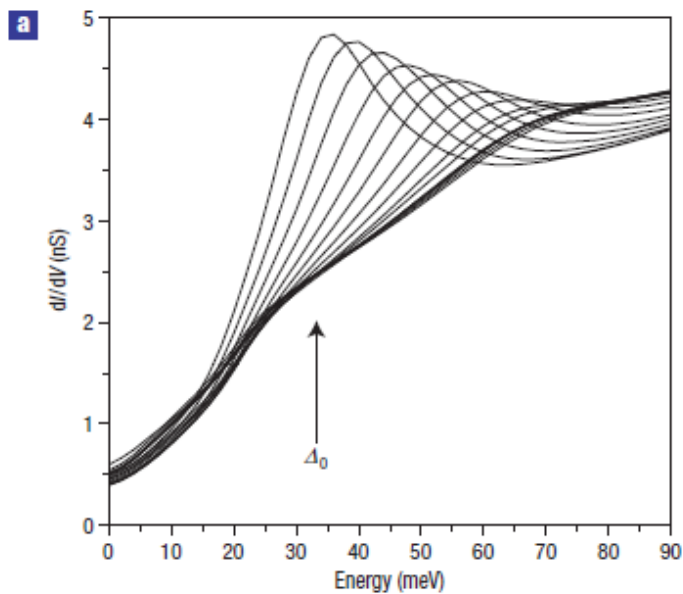
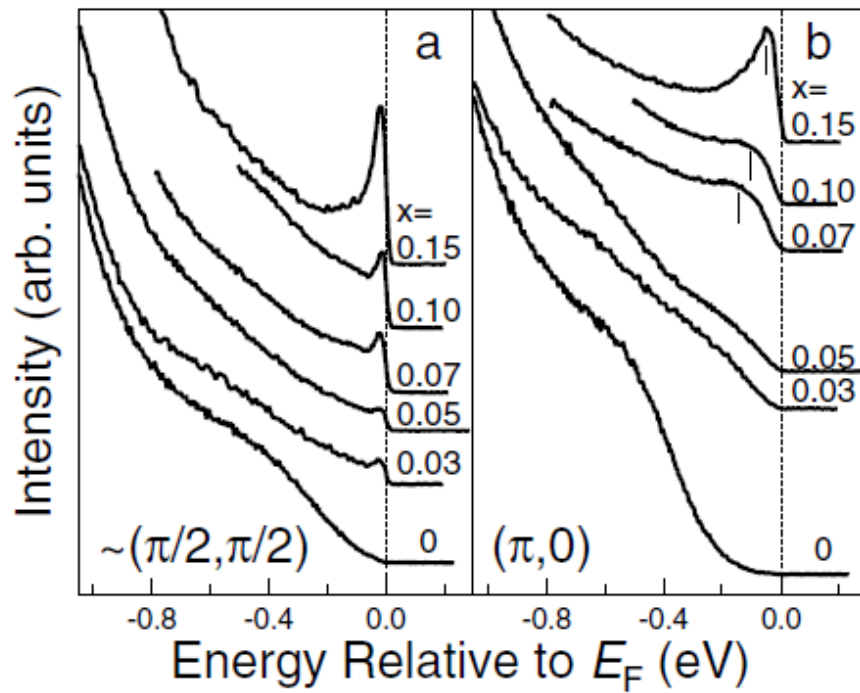
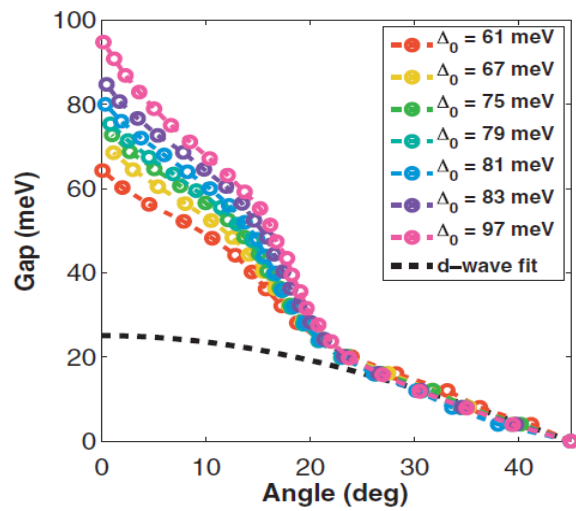
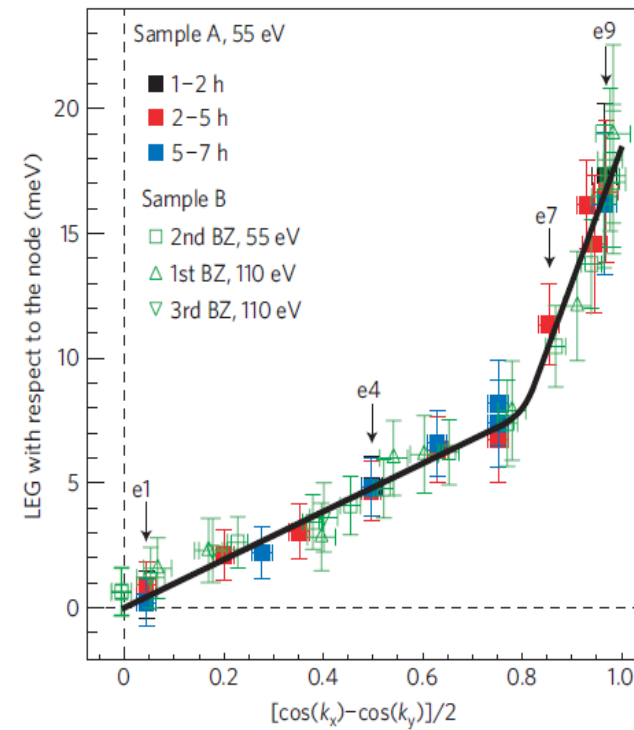


Figure 5 | Bipartite electronic structure of copper oxides as $p \rightarrow 0$. a, The E =Pseudogap



Pushp, Yazdani et.al
Science 2009

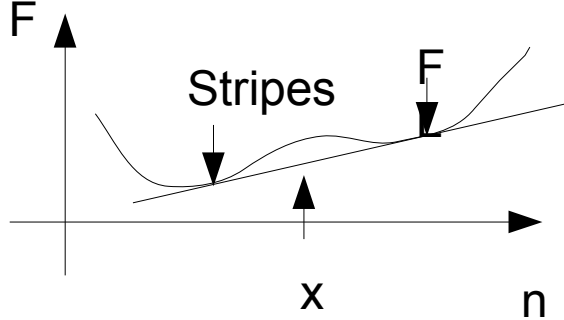


Rui-Hua He, Z-X. Shen
et al., Nat. Phys. 09

How can nodal states and stripes coexist?

Phase separation?

Will not have the correct Luttinger volume

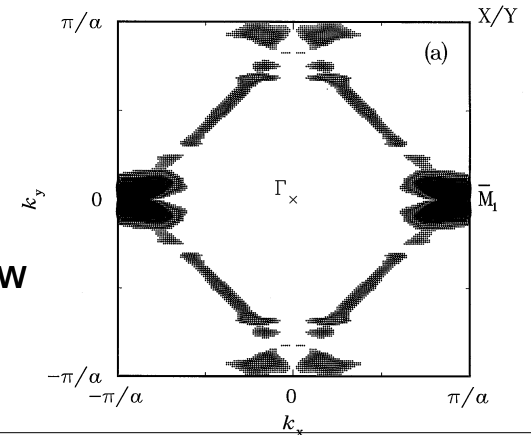


Weak coupling stripes

Glassy physics?

M. I. Salkola, V. J. Emery, and S. A. Kivelson, PRL '96

Can one have narrow quasiparticles?
Luttinger volume?



Dynamic CDW/SDW Scenarios
Fermi liquid at low energies stripy
at high energy

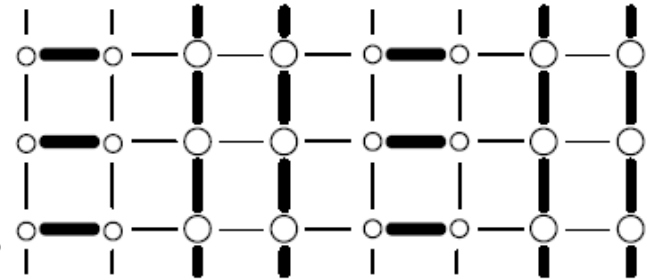
Seibold, Grilli, Lorenzana

$\langle \Delta(t) \Delta(0) \rangle$ Kampf-Schrieffer-type

$\Delta(\omega)$ Eliashberg type

d-wave like stripes
M. Vojta talk.

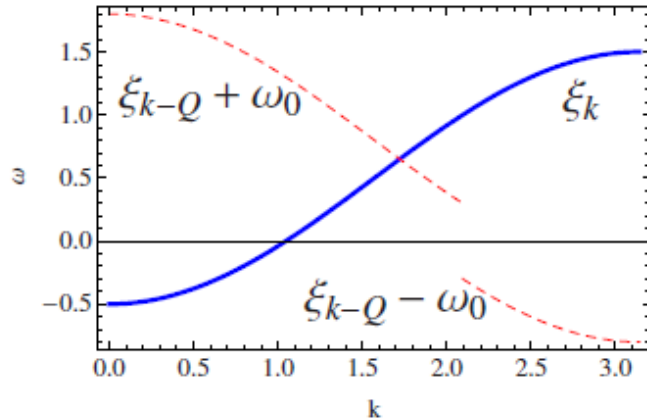
Do they need
superconductivity?



Pair density waves?
J. Tranquada talk.
Cause or consequence?

Dynamic Charge/Spin order

$\langle \Delta(t) \Delta(0) \rangle$ Kampf-Schrieffer-type

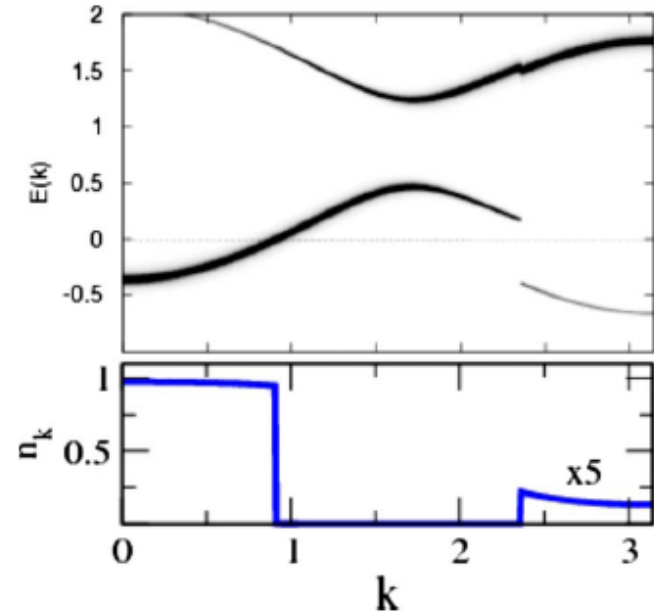


Addition $\omega > 0$

State	$E_\nu^{N+1} - E_0^N$	Momentum
$c_{k\sigma}^\dagger \phi_0^N\rangle$	ξ_k	k
$c_{k-Q\sigma}^\dagger b_Q^\dagger \phi_0^N\rangle$	$\xi_{k-Q} + \omega_0$	k

Removal $\omega < 0$

State	$E_0^N - E_\nu^{N-1}$	Momentum
$c_{-k\sigma} \phi_0^N\rangle$	ξ_{-k}	k
$c_{-k+Q\sigma} b_{-Q}^\dagger \phi_0^N\rangle$	$\xi_{-k+Q} - \omega_0$	k



$$A(k, \omega > \mu) = \sum_\nu |\langle \phi_\nu^{N+1} | c_{k\sigma}^\dagger | \phi_0^N \rangle|^2 \delta(\omega - E_\nu^{N+1} + E_0^N),$$

$$A(k, \omega < \mu) = \sum_\nu |\langle \phi_\nu^{N-1} | c_{k\sigma} | \phi_0^N \rangle|^2 \delta(\omega - E_0^N + E_\nu^{N-1}),$$